

## REPORT ON A VISIT TO THE RECENTLY EXCAVATED KILN SITE AT BAN INTAKIN, NORTHERN THAILAND

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### ABSTRACT

The study of Thai ceramics is complicated by the lack of records, and while some ceramics are signed, none are dated. Given the expensive nature of field work, the most recent kiln site excavation in the north, by the Thai Department of Fine Arts in 1996, at Intakin near Chiang Mai, is of great interest. But the findings of the report (Prishanit and Suphamas 1997) are questioned, particularly that these kilns fired high temperature glazed stoneware, because of the complete absence of slag or natural fly ash glaze on kiln surfaces usually associated with wood fired kilns, and the absence of kiln furniture essential for glaze firings. Further, the construction method used for the kilns is suggested to be surface/slab, but there is no evidence of a slab of clay forming the kiln, and, rather than being surface built, the kilns appear to have been fired from a pit – i.e. they are in-ground. In-ground technology is simple but effective, and was used unchanged over many centuries concurrently with an evolving technology that led to the development of surface brick-built kilns. This paper argues that the Intakin kilns belong to the former technology and so are unrelated to Thai glazed stoneware.

**KEYWORDS:** Thailand, Sukothai, Chiang Mai, Intakin site, ceramics, kilns, glazed stoneware, northern kilns, ceramic technology.

### INTRODUCTION

The study of South East Asian ceramics is a compelling adventure because of the dearth of records left by the potters themselves or by merchants and others who dealt directly with (them) (Richards 1995).

It is only recently (since 1980) that scientific exploration of Thai kiln sites has been undertaken. Until then, authors relied on historically or stylistically based approaches, commonly with an assumed belief that technology was imported and Chinese influence dominant. On the contrary, Thai kilns, once introduced, have been shown to evolve indigenously at Si Satchanalai (or Sawankalok as the wares have come to be known) on the central plains over centuries, perhaps from the C10 to C17, from simple in-ground kilns to surface brick built kilns that at the peak of the industry competed on the export market with the Chinese (Brown 1988; Hein 1990). There were also northern Thai or Lanna ceramics

similar to, but different from Sawankalok: scattered rather than focused, and regional rather than export, but some of the finest stoneware was made in the north. How the industry began and ended is still unclear. For example, while it is argued that the Khmer could have introduced glazed stoneware to Thailand from the south (Grave 1995), it is also suggested that the technology may have first developed in the north where many kiln sites are known (Shaw 1989).

In February of 1999 I visited the recently excavated kiln site at Intakin as part of ongoing field-work. The focus of my research is the high-fired stoneware of the central region of Ban Ko Noi (or Si Satchanalai). I have visited many kilns and kiln sites from Khmer in Buriram province in the south through central Si Satchanalai and Sukothai to Kalong, Pa Sarn, Wang Nua and Phan in the north, as well as visited major public and private collections throughout Thailand.

The Intakin site is a group of five kilns in northern Thailand about 40 km from Chiang



Fig. 1. Map of mainland South East Asia showing Intakin site near Chiang Mai in northern Thailand.

Mai (Fig. 1). The kilns are of the wood-fired cross draught typical of the Thai genre of kilns (Fig. 2). Initial investigation of the group of five in-ground kilns was undertaken by a team from the Thai Department of Fine Arts, Archaeology Division in 1996 (Prishanit and Suphamas 1997).

The Fine Arts Department has so far surveyed thirteen northern sites but excavated only a few of them. Therefore, given the expensive nature of the field-work, new information is important to the increased understanding of the emerging story of the development of Thai ceramics.

#### THE DEVELOPMENT OF THAI STONEWARE

Glazed stoneware has been produced in China from very early times. Certainly by the Han Dynasty (started C3 BC), a wide variety of ash glazed vessels were produced in significant numbers after several centuries of prototypes and experiment (Brown 1989).



Fig. 2. Intakin kiln No 1, a small in ground kiln about 4 metres long, excavated by the Thai Department of Fine Arts in 1996.

It should also be remembered that the first stoneware, German salt glaze, was not widely produced in Europe until much later, around the C14 AD, and true porcelain not until the early C18 (Charleston 1977).

**The development of high fired ceramics in Thailand.** Stoneware appears in Thailand by at least the C10, though the means of dissemination are unclear. Brown (1989) argues that the least likely explanation for the beginnings of the Thai pottery industry is that it was a local invention. It cannot be mere coincidence that the only other countries in the world besides China to make high-fired ceramics in early times are all on or near the border of China (Brown 1989).

Without access to accurate historical records, the story of Thai ceramics relies on archaeological evidence, and so remains at this stage still in part untold. It is an exciting if somewhat unlikely prospect that high-fired ceramics developed independently in

the northern regions, as stoneware had already developed in China many centuries before. But because fly ash falling onto the ware, or build up of glaze slag on the kiln (or furnace) itself must have been the inspiration for stoneware glazes, the possibility of independent discovery remains open. It must also be remembered that the metal smelting of the Ban Chiang culture, which also produced ceramics, evolved in the northeast in very early times (Labbe 1985; White 1982). Bronze smelting has both the required temperature and reducing atmosphere required for high fired ceramics. Further discoveries in the future may confirm a continuous sequence of development.

**Theories for the origins of Thai high-fired ceramics.** The traditionally accepted and still widely held popular view is that Thai ceramics were introduced by King Ramkamhaeng, who brought back "500" potters after a visit to China in 1296 as is recorded on his famous (or infamous) stone inscription which is now thought to be mostly legend (Krairikh 1988; Vickery 1987). Until about twenty years ago most writers (eg. Willets 1973; Spinks 1965) referred to the Chinese connection for the introduction of the ceramics industry and ongoing influences. The extent of ethnic Chinese influence in Thai ceramics is debatable. The Tai, who are believed to have filtered into what is now Thailand from parts of (what is now) southern China where cross draft kilns producing glazed stoneware are known to have been active since at least the Tang dynasty (AD 618 - 906), could perhaps have brought the kiln technology themselves (Brown 1988).

Technology transfer is evident for the introduction of in-ground kilns, and some other developments such as the move to primary white clay, and some design and decoration. Throughout the early 1980s, a team of Australian archaeologists led by Don Hein undertook excavations at Ban Ko Noi and found no evidence at the site of foreign presence:

An awareness of other sites and ceramic products from foreign sources were certainly known and these seem to be the inspiration of some ideas, but essentially the existence

of the Ban Ko Noi ceramic site was the product of local knowledge and initiative. There is no evidence of foreign people; no graves, habitation sites, inscriptions, coins or artefacts or objects that might support the notion of foreign presence (Hein 1990).

Potters' marks as writing rather than symbols are not common on Thai ceramics, but when present they are all in Thai script. There were no Chinese (or other) characters used. Chinese wares are found at some sites, particularly Ming shards at upper levels.

A possible Khmer origin is argued (Grave 1995). One of the last major technological innovations of centralised polities in pre-industrial Southeast Asia is the production of high temperature glazed and unglazed stoneware. The introduction of stoneware production in mainland Southeast Asia happened around 1000 AD. At this time, stoneware production is argued to have commenced at a number of Khmer controlled regions, e.g. Ban Kruat in Buriram province (Grave 1995). While the Khmer did occupy northern central Thailand before the rise of Sukothai, the ware produced, and the kilns, are very different. The Khmer kilns are surface built slab kilns with common walls and internal roof supports, nothing like the Thai in-ground kilns (Hein 1984).

Vickery (1986) has identified Mon words for ceramic terms, even possibly for the origins of the term Sawankalok itself, suggesting a Mon link to the early Thai Kilns. It is clear that while many theories exist for the origins of the industry, it is evident that once in-ground technology is introduced, a localised evolution occurs, as is clearly demonstrated at Ban Ko Noi (Hein 1990), and also in the north, though northern developments are not so clear (Shaw 1989).

**In-ground kilns.** These first Thai kilns were simply holes dug in a river bank, later from a pit, somewhat like a rabbit burrow. There was a hole down the bank to load and fire, a chamber for the wares and a hole or flue two or three metres higher up the slope for the exit of smoke (Hein 1984). River banks have a high clay content and so the earth itself formed the kiln walls. The kilns were easy enough to construct as the kiln



was the dug hole, but they were not without problems. The kilns were subject to annual flooding of the river in monsoon season. They were doomed to fail as repeated firings progressively shrunk the clay content and opened up cracks in the roof which eventually would cause the roof to fall onto the wares. Before this happened, slag from the iron rich walls, composed of river terrace clay into which the kilns were dug, formed and dripped onto the wares (Hein 1990). All the same, it is estimated that an in-ground kiln lasted for a generation or so; for more than a couple of hundred firings.

**Constructed kilns.** Grave (1995) argued that without some modification, simple in-ground kilns could not fire to stoneware. Typically, modification to the fire-box was one of the first developments to improve the efficiency of the kiln, as high firing (to temperatures of 1260 degrees or so) required technological innovation, particularly to the firewall, the slope of the chamber, and the chimney. There are powerful reasons for the development of kiln technology; bringing kilns out of the ground was labour saving and overcame seasonal dampness problems. A constructed chimney, one of the earliest developments, meant that no longer was a deep firing pit needed, and work could occur at or near ground level. Constructed kilns, when they failed, could be thrown down and rebuilt on the spot, whereas in-ground kilns always required relocation, and more importantly, costly relocation of related production infrastructures.

The marvellous sequence of localised invention and development from in-ground to above-ground brick built kilns is revealed at Ko Noi, the major Sawankalok site, where the later kilns still retain the quaint burrow shape of their predecessors (Hein 1990, 1984).

**Thai ceramics at Sukothai.** Sukothai was the first of the Thai city-states to gain independence from Khmer rule in the C13 and is regarded as the foundation of the modern Thai nation (Shaw 1989). Thai ceramics are best known by the export wares from this area found in the Philippines, and more recently in Indonesia, for example from grave sites in Sulawesi (Richards 1995;

Brown 1989). The major kiln site is at Ban Ko Noi near Si Satchanalai, a sister city to Sukothai, on the central plains. Here is one of the best preserved and largest kiln complexes in the Asian region. These kilns (Fig. 3) evolved indigenously over many centuries, perhaps C 10-17 (Barbetti and Hein 1989), from in-ground to surface brick built kilns up to ten metres long. At its peak, the industry competed on the export market with the Chinese, as well as producing large amounts of domestic sculptural and architectural ceramics for brick palaces and temples. Northern ceramics, which were not export oriented, have often been overshadowed by the scale of the Sawankalok sites and the extensive research undertaken there (e.g. Hein 1990; Hein and Barbetti 1989).

**Northern Thai ceramics.** In the north, separated physically (and culturally) from Sukothai by mountain ranges that eventually become the foothills of the Himalayas, the second major Thai state of Lan Na with its capital at Chiang Mai was established also in the C13. Lan Na translates literally as one million rice fields, and there are many paddies in a series of isolated fertile valleys separated by mountain ranges and jungle, and dozens of kilns in scattered groups, some in-ground, and some utilising slab and brick construction. These sites include Phan (Gluckman 1974), Kalong, Samkampaeng, Phayao, and Nan. (Shaw 1989; Rooney 1990). Brown (1989) lists nine northern sites. Kalong is perhaps the major region, and a kiln from Wang Nua was excavated and rebuilt in the grounds of the Chiang Mai Museum by the Department of Fine Arts in 1982. Unlike the potters of the central plains with access to river systems and the export trade, Lan Na potters produced for the domestic market. As northern palaces and temples were built of teak, there was no demand for architectural ceramics. There were northern trade routes down the Mekong and into Burma and the coast, but Lan Na ceramics have so far not been found at export sites outside Thailand.

In the north, food was traditionally eaten (and still is) from a banana leaf, and sticky rice scooped directly from the cooking pot



**Fig. 3.** Ban Ko Noi surface kiln, partly reconstructed, about 10 metres long, which produced high-fired stoneware for export about the late 16th century.

and rolled into a ball with fingers. The bowl illustrated (Fig. 4), with underglaze decoration of a stylised chrysanthemum, would have been prestige ware for palace or temple, and is an excellent example of a high-fired stoneware from Kalong, just north of Intakin. The bowl is typical of the finely potted and strikingly decorated ware that in Shaw's opinion:

...vindicated my belief that Northern Thai ceramics should not be treated as poor country cousins of the wares produced further south. They are probably the finest ceramics ever produced in South East Asia (Shaw 1989).

What is badly needed is another find giving clearly datable ware and kilns to provide more concise evidence about the nature and development of the industry.

**Possible causes for the decline of the industry.** In the late C16 the Burmese overran and ransacked Thailand, and the ceramics industry may have been too

weakened to return to operation (Shaw 1989). However Chiang Mai and Sukothai fought a series of wars in the late C14, but during the conflict the industry continued, and in fact was at one of its peaks. (Brown 1989). Thus war may not have ended the industry. There are many other theories for the decline: changing demand, competition from Chinese blue and white porcelain which the Thais did not produce (Richards 1995), or the appearance of European traders and the emergence of a new global rather than regional economic trade structure (Grave 1995), are all possible factors.

The Europeans, particularly the Dutch, did keep accurate records, and there is some archaeological evidence from sunken ships and their cargo (Green 1990). The Thai ceramics export industry finished around the end of the C16 or early C17, and it cannot be coincidence that the northern industry also declined around the same time (Shaw 1989).

**Scientific dating of Thai kilns.** A great deal of investigation has been undertaken for Sawankalok ceramics, but comparatively



Fig. 4. Kalong dish, dimensions 240 x 550 mm. Stoneware with underglazed brushed geometric floral design, about 15th century. Collection: MAGNT (ref no IND 2062). Kalong, near Intakin was a major production centre of glazed stoneware.

little for northern wares and kilns. At Si Satchanalai, three major museums have now been built. In the Kiln 42 Museum, a sequence of eleven kilns is revealed (Hein 1984), with a large brick built kiln KN111 uppermost, and an in-ground kiln KN110 at the bottom. In the Kiln 61 Museum, a collapsed in-ground kiln reveals unglazed stoneware jars still in situ in the firing chamber.

Radiocarbon, thermo-luminescence and palaeomagnetic dating, although preliminary (Barbetti and Hein 1989), seem to confirm the C10-17 time line for the operation of the Ko Noi industry. An important point to note is that while KN110 dates to 970 years BP, KN61 is 400 years younger, though both are in-ground kilns (Barbetti and Hein 1989). What this indicates is that demand for unglazed wares continued for a long time, and the in-ground kilns which were most

suited to fire them continued to be used contemporaneously with above ground kilns which evolved at the same time.

In the north, no kiln groups have been dated except for the Intakin group. Preliminary unpublished findings for these kilns is a series of readings giving a range of dates consistent with the fifteenth century (Barbetti 1998, pers com). That is, like KN61 at Ko Noi, the Intakin kilns in northern Thailand are later rather than early in-ground kilns.

#### The importance of the northern kilns.

Because of the long sequence of development in the ceramics of the Sukothai region, it was at first assumed that the northern kilns were derivative: most writers preferred the simple theory that all of the northern kilns were the work of potters from Si Satchanalai. But as more and more kiln sites have been discovered (with no end in sight) it has become clear that the explanation must be far more complex. The earliest wares in the north and at Si Satchanalai seem to be offshoots from a single shared tradition still undetected (Brown 1988). The Intakin kilns therefore are important to the understanding of kiln evolution.

Shaw (1989) has no doubt that the northern in-ground kilns evolved first, and the technology spread south, and that the early Lan Na dishes fired rim to rim and base to base are the common denominator:

... there is no doubt that they are closely related. An even more striking similarity is the use of incised decoration on the vases and dishes of Payao and 'Mon' Ko Noi. Which then is the father of all kilns working in this tradition? - Payao seems to me to be the most likely to have been the centre whence spread the knowledge of making high-fired ceramics (Shaw 1988).

It is an exciting prospect that high-fired ceramics developed independently in the northern region, though stoneware in a different form had developed in China a long time before. Further discoveries in the future may confirm further details of the sequence of development. In this context the Intakin



kilns are potentially very important to our understanding of Thai ceramics.

## THE INTAKIN KILNS

The Intakin kilns are literally in the back yard of a villager's house. The site has been roofed, making it protected. The villager has a caretaker role, and also sells postcards to help fund this. Directions to the kilns for tourists are given in English and Thai are accessible, unlike earlier northern sites which, left unprotected, are now hard to access. The site is on a slope at the edge of an alluvial plain known as *Thung Phan Eag Phan Fyn Muang Khaen*, 'the field of a thousand yokes and harrows', about 40 km from Chiang Mai. This would have been an important rice cultivation area that supported the population of the early city. Clay, wood and water were in abundant supply. Three kiln sites have been identified here so far by the Department of Fine Arts, but there must be dozens spread about the north (Brown 1989).

There are five kilns in the Intakin group, and the two excavation pits reveal that the kilns are small, less than four metres long, and have an unusual wedge-shape with high fire-wall and flat, low roof to the firing chamber. They are important kilns confirming a mature variation on a theme, reflecting the indigenous nature of the industry and demonstrating that they are not a slavish copy of an imported design. Prishanit and Suphamas (1997) describe the kilns as:

... clay slab kilns of cross draught type which are determined as above ground type, relatively intact except for the collapsed roof of the firing chamber.. The Kiln's shape viewing from above are similar to laid jar with mouth rim down to earth at lower level and it's narrow foot rim raised up. such shape defined as 'jar like kiln' or Tao Hai.

In my opinion, the kilns are not surface/slab, but in-ground, and the jar-like shape indicates the presence of a firing pit needed for in-ground but not surface kilns. I

also doubt that the kilns fired glazed wares.

Dimensions, floor slope, orientation etc are given, and the accompanying shards found in the excavation catalogued as 'kiln wasters'. (Wasters are rejected pots that are too badly damaged in the firing to be commercial, though in practice any pot that could function at all was used). The glazed finds at the kiln site are classified (Prishanit and Suphamas 1997) as celadon plates, dishes and lidded jars, and large storage jars with greenish or brown glaze. These finds are common products of the region (Shaw 1987) and I believe these are not necessarily products of the Intakin kilns. The presence of these ceramics also suggests that the kilns are not early - such wares are from the mature period, but while in-ground kilns with simple technology were the earliest kilns, they have continued to operate alongside the more advanced kilns.

In the following discussion I seek to support these arguments and to re-evaluate the findings of the report of Prishanit and Suphamas (1997).

## REINTERPRETATION OF THE INTAKIN KILNS

On the basis of my research into similar kilns in Thailand, observations of ceramics collections, and my experience as a potter using wood fired kilns, I propose some alternative explanations for the observed features of the Intakin kilns.

**Lack of slag or glassy coating on kiln surfaces.** It is unlikely that these kilns were used to produce high temperature glazed stonewares. An examination of a fragment of the Intakin firing chamber (Fig. 5b) shows very little build up of slag due to fly ash and volatilised glaze as one would expect, and which is present on the Ko Noi kiln sample (Fig. 5a). The piece of the Intakin wall has only a very thin, dry coating of a matt slag, and the rest of the wall is quite friable compared to the vitrified brick of the other kiln. It must be remembered that these kilns were fired to the end of their life, perhaps ten or twenty years, that is, until the roof collapsed. If high-fired glazed stoneware



Fig. 5. Comparison of firing chamber fragments from Intakin and Ko Noi kilns: A, the Ko Noi piece shows glassy slag, is vitrified and dense due to repeated high firings; B, the Intakin section has only a thin matt crust and is friable. This suggests the Intakin kilns did not high fire glazed wares.

was produced, the characteristic slag is unavoidable, as it builds up, after repeated firings from fly ash and volatilised glaze at the high temperature required to produce a glaze. While the Ko Noi sample is from large scale export production, this slag is present on other Thai cross draft wood fired kilns that I have observed, from Khmer onwards. The excavation of a kiln at Ban Bok Suak, Nan province (Praicharnchit 1985) found glazed wasters in association with kiln structure (walls) lumps of fired clay covered on one face with a natural ash glaze 0.4 - 1.0 cm thick, and kiln furniture coated with an olive brown natural fly ash glaze. This report (Praicharnchit 1985) details a northern kiln site with substantial evidence for glaze production through wasters and slag deposits. Yet glassy slag is completely

absent at the Intakin kilns either in the chamber or the firebox.

**Lack of associated kiln furniture.** Unglazed wares can be stacked together, but all glazed surfaces must be separated from contact with each other during firing. There is no associated kiln furniture, such as tubular firing supports or spurred discs usually used to separate glazed pots (Hein 1990), listed amongst the finds at the Intakin site by Prishanit and Suphamas (1997). A common northern practice was to fire bowls rim to unglazed rim (Shaw 1989), but such wares as the glazed celadon bowls discovered at this site cannot be stacked together and need furniture, yet no such furniture is disclosed at the Intakin site. John Shaw's extensive collection of northern ceramics also includes many items of kiln furniture, in fact much more varied than Sawankalok, so it is curious that none at all were found at the Intakin site if glazed stoneware was produced there.

**Waster or rubbish?** Kilns are typically surrounded by evidence of what was fired in them; wasters, that is ware with firing faults thrown to the side as quality control is exercised over a long period, as at Ko Noi (Hein 1984) and indeed at all kiln sites that I have visited. But at Intakin, these shards were found in the work areas - i.e. the firing pit and down the chimney. It is unlikely that the potters would have dangerously cluttered the work areas, and certainly not the firing pit. I suggest that when the kiln was finally abandoned, the hole was used as a rubbish tip, typical of any hole in the ground. The broken ceramics are consistent with the range of wares in use in a community of that era as mentioned above, and that might break in use and so be discarded. The variety of shards found down the chimney of the abandoned kiln No 2 may well be rubbish rather than wasters.

Some evidence of what the kilns did fire would be expected to lie near the kilns as wasters, but the excavation was perhaps not broad enough to locate such a dump outside the kiln/firing pit area, though the 'prefired potsherds' (that is unglazed potsherds mentioned as 'unusual finds' by Prishanit and Suphamas (1997)) might be such wasters.



At the kiln site only a couple of samples of broken pottery remain, and a further half dozen or are illustrated in the report by Prishanit and Suphamas. These shards would appear to be broken pottery rather than wasters which should show kiln damage. These shards are from a very wide range of wares from large brown glazed jars to incised celadons typical of export ware. There is a greater variety present than might be expected to be produced from a small group of kilns, given the degree of specialisation that is typical of most kiln sites (Hein 1990).

**The construction of the kiln.** Although reported as being a slab kiln by Prishanit and Suphamas (1997), the body of the kiln shows no evidence of being produced from a slab of clay, which would be expected to be of different colour and texture to the surrounding earth, and with a clearly defined boundary. Only the upper part of the chimneys at ground level seem to be constructed of a separate slab of clay. What the excavation has revealed is the band of heat-treated earth caused by repeated firings. From about twenty centimetres or more from the kiln chamber, into the surrounding earth, some effect would be noticed - typically a reddish discolouration at the outer limit - but only the first few centimetres physically changed to fired clay, fired high enough for the wall to become hard and permanent. It is to this point that the kiln excavation has pared down, but it is not a slab. What is present is a friable, iron rich fire hardened earth typical of alluvial clay / loam soil of the kiln surrounds. This indicates that the kilns are of the in-ground genre, excavated rather than built.

**In-ground kilns are operated from a firing pit.** The kiln (Fig. 6b) does look like a jar, but the rim at the mouth is not a feature of the kiln itself, but rather a remnant arc of the excavated firing pit. A rim or snout is needed with in-ground kilns to support the earth around the kiln, whereas a slab kiln is supported by the thickness of the slab and needs no such support.

The kilns were fired from a pit, as shown in Figure 6b, which was re-used for subsequent kilns. A second kiln is clearly



**Fig. 6. A, lateral; and B, plan view of the Intaken kiln** showing the free-form shape with the chimney at a slight lean and off-set to the side, indicating that it was excavated rather than constructed. The dotted line indicates a small fire hardened arc that was a section of the circular firing pit, rather than a jar-like rim to the kiln itself as interpreted by Prishanit and Suphamas (1997).

dug lower and a third kiln is offset deeper again at a different angle to take advantage of the existing infrastructure of the pit such as access steps, fuel storage and sorting and loading areas. It would not be logical for this to occur with a surface kiln construction because the kiln would simply be knocked down and rebuilt on the same spot.

**The shape of the kiln.** The roof of the kiln is almost flat. This would be very difficult but not impossible to construct, over a bamboo frame for example. However, when the slab was covered with earth, it could not have long sustained the weight of the covering soil, or its own weight over more than a limited number of firings. Later kilns were built on the surface to provide a saving of labour, but Intakin kilns are clearly in-ground, not slab, and were fired from a dugout pit.

The kiln shapes as illustrated in Prishanit and Suphamas (1997: Plan 4) are very geometric. In actual fact, the kilns are very organic or free-form shapes as the sketch (Fig. 6) shows, with curves varying and the chimney off to one side, which one would expect of a dug kiln with technicians working by eye in a poorly lit space, rather than a constructed kiln that could be erected carefully according to a precise plan.

The Intakin kilns are clearly of cross draught construction traditionally producing high fired stoneware. Earthenware has been produced in the region for centuries, but the earthenware kilns are a different style, being simple constructions for low-fired cooking and other domestic wares. A fire is lit under the ware in a hollow chamber and enclosed at the top with broken pottery etc. to seal in heat, and then fired to less than 1000° C - very basic kilns compared to the Intakin kilns. It would make no sense to build a complex kiln to produce earthenware in lieu of available simple updraught technology.

**Possible wares fired at Intakin.** By deduction, if the kilns did not produce high-fired glazed stoneware or earthenware, it is possible that they mostly fired low temperature unglazed but vitrified vessels of a uniform size because of the flat and fairly low roof. These vessels, perhaps jars or bottles, if of a red clay, might well have vitrified at around 1100° C. At this lower temperature little or no fly ash slag would occur, and there would be no volatilisation from glaze. Many stoneware jars such as water storage jars were, and still are, unglazed (Hein 1984), and there would have been a large domestic demand, when the Intakin kilns were operating, particularly as Intakin was in a heavily populated region. Some unglazed stonewares are still produced today, for example the ubiquitous mortar and pestle used for green pawpaw salad. Prishanit and Suphamas (1997) note unglazed fish net weights were found at the site, and:

Pre fired pot sherds found in excavation are rare and unusual evidences among archaeological finds ever discovered at ancient kiln sites in Thailand. They are unfired dish or bowl of white body.

Prishanit and Suphamas (1997) seem to be referring to the general Thai practice of once-firing wares and not bisque firing and glazing separately with two firings as is the more widely used industry technique in manufacturing ceramics. But "unfired" may be a translator's error: if we read *unglazed* for *unfired* this may in fact indicate the presence of unglazed stoneware. These unglazed stonewares would quite likely be products of the Intakin kilns; the glazed stonewares, I have suggested, were more likely to have been rubbish thrown into the kilns areas after their working life ended in the fifteen century.

## CONCLUSION

The Intakin site is valuable to our understanding of the origins of Thai ceramics, given the limited body of knowledge and the expense of excavations restricting further information. I have argued that they are simple, dug out in-ground kilns rather than technically more complicated constructed slab built kilns as suggested in the report by Prishanit and Suphamas (1997).

The texture and composition of the kiln's earth construction is consistent with the surrounding soil; an introduced slab would be of a different and better quality clay. There are indications that the operation was from a firing pit, and that this same pit was used for at least three kilns because of their orientation towards a central work point. The Intakin kilns date to the C15, well after ceramics production first began in the north. They are clearly a variation on a regional theme, similar to, but different from, other northern kilns. Modifications to the firebox and the flue confirm later technology, but not that of the evolution to surface/brick construction, and provide no new information about the evolution or origin of northern Thai kilns.

There is no evidence, apart from a few pieces of broken ceramics recovered at the site, to suggest that these kilns fired glazed stoneware. There is no indication of slag or fly ash glazing on kiln surfaces and there is a complete absence of kiln furniture needed

to produce glazed wares. The discarded ceramics are likely to be accumulated rubbish rather than kiln wasters. Unglazed wares were in demand for domestic consumption, and it is probable that these were the products of these kilns. Further research is required into the structure of the Intakin kilns and the wares fired in them to clarify the place of these kilns in the history of Thai ceramics. In the absence of recorded information, and the existence of often fanciful chronicles written centuries after the event, and with the rapid decay of wooden structures, ceramics provides important clues to the past. How the Thai ceramics industry began and ended is still unclear, and must reflect the rise and fall of Thai culture itself. Continued ceramics research will provide further answers, not just about ceramics, but also about the history and culture of Thailand and the South-east Asian region.

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